

Application No. 10/792,342

Reply to Office Action

REMARKS/ARGUMENTS***The Pending Claims***

Claims 1-13 and 15 are pending. Claims 1-13 and 15 are directed toward a polyurethane polishing pad for chemical-mechanical polishing.

The Specification and Claim Amendments

The specification has been amended to correct the cross-reference to related applications. Claim 1 has been amended to incorporate the subject matter of claim 14. Claim 14 has been canceled. No new matter has been added by way of these amendments.

Summary of the Office Action

The Office Action rejects claims 1 and 6-9 under 35 U.S.C. § 102(b) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious in view of U.S. Patent 4,239,567 (hereinafter "Winings"). Claims 11 and 12 stand rejected under 35 U.S.C. § 103(b) as allegedly obvious in view of Winings in combination with U.S. Patent 6,790,883 (hereinafter "Ogawa"); claims 2-5, 13, and 14 stand rejected as allegedly obvious in view of Winings in combination with U.S. Patent 5,670,102 (hereinafter "Perman"); and claim 15 stands rejected as allegedly obvious in view of Winings in combination with U.S. Patent 6,239,188 (hereinafter "Kihara").

Furthermore, the Office Action rejects claims 1 and 4-10 under 35 U.S.C. § 102(e) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious in view of U.S. Patent 6,406,363 (hereinafter "Xu"). Claims 11 and 12 stand rejected as allegedly obvious in view of Xu in combination with Ogawa; claims 2, 3, 13, and 14 stand rejected as allegedly obvious in view of Xu in combination with Perman; and claim 15 stands rejected as allegedly obvious in view of Xu in combination with Kihara.

The Office Action rejects claims 1-10 under 35 U.S.C. § 102(e) as allegedly anticipated by or, in the alternative, under 35 U.S.C. § 103(a) as obvious in view of U.S. Patent Application Publication 2003/0100250 (hereinafter "West, Jr."). Claims 11-12 are rejected as allegedly obvious in view of West, Jr. in combination with Ogawa.

Finally, claims 1-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-13, 15, and 16 of copending Application No. 10/792,183 and claims 1-15 and 17-31 of copending Application No. 10/281,782.

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Discussion of the Anticipation Rejections

Since claim 14 was not subject to any of the anticipation rejections, and since the feature of claim 14 has been incorporated into claim 1, from which all other pending claims directly or indirectly depend, all of the anticipation rejections have been rendered moot.

Discussion of the Obviousness Rejections

Since the feature of claim 14 has been incorporated into claim 1, from which all other pending claims directly or indirectly depend, all of the obviousness rejections have been rendered moot except for the obviousness rejections of claim 14 based on the combinations of (a) Winings and Perman and (b) Xu and Perman, which are considered below with respect to all of the pending claims.

The Office Action asserts that it would have been obvious to one having ordinary skill in the art to employ the microcellular foam of Perman to make a polishing pad because the features of the Perman microcellular foam are well known in the art and Perman provides necessary details to practice the invention of Winings or Xu. Applicant respectfully traverses the obviousness rejections based on the combination of (a) Winings and Perman and (b) Xu and Perman for two separate reasons: (1) there is no motivation to combine the references and (2) the combination of references fails to teach or suggest all of the claim limitations.

Winings generally refers to a polishing pad 25, but Winings fails to identify or describe polishing pad 25 in any way (see col. 3, lines 32-68). Applicant notes that the composite sheet made of a base matrix of polyester fibers and a polyurethane foam surface layer 48 described in Winings is not a polishing pad; rather, it is a wafer mounting surface. Xu teaches that the polishing belt can be made of any suitable polymeric material and can be solid or cellular (see col. 4, lines 5-18). Xu also teaches that if polishing belt is made of a cellular layer, the cells can be open or closed and can be formed by any suitable means (see col. 4, lines 22-23). Therefore, neither Winings or Xu provides any specific guidance in selecting a material for a polishing pad. Perman discloses a method of making microcellular foams. Notably, Perman does not teach or suggest the use of its microcellular foam in polishing pads. Thus, the disclosure of Winings, Xu, and Perman provides no motivation to one of ordinary skill the art to produce a polishing pad using the microporous foam of Perman.

The combination of references also fails to teach or suggest all of the claim limitations. Particularly, none of the references teaches or suggests a polyurethane polishing pad for chemical-mechanical polishing which can polish a silicon dioxide wafer at a rate of at least 600 Å/min under the recited conditions *without externally produced surface texture* as required by the pending claims.

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It is well known in the art that for effective polishing, the pad surface must have both microtexture and macrotexture. *See* D.B. James, "CMP Polishing Pads," Chemical-Mechanical Planarization of Semiconductor Materials, Chapter 6, (Springer, 2004), p. 189 (hereinafter "James"). Macrotexture refers to a large dimension texture, such as a geometrical arrangement of grooves, which enables the transport of a polishing composition of slurry through the pad. Macrotexture is usually created by cutting or lathing grooves into the pad, i.e., by external means. Microtexture "refers to the roughness of the pad surface and the presence of asperities which contact the wafer." James, p. 189. Polishing pads contain some degree of intrinsic microtexture as a result of the method of manufacture. For example, the pores on the surface of a porous pad create a rough surface. However, even with porous pads, it is generally accepted that conditioning, or break-in, is required to achieve effective polishing. *See* James, p. 189. Conditioning is a method of externally producing texture and consists of roughening the surface of the polishing pad, usually with a diamond impregnated tool. Conditioning "is critical to CMP as an inadequately roughened pad surface results in a very low polish rate." *See* M.R. Oliver, "CMP Technology," Chemical-Mechanical Planarization of Semiconductor Materials, Chapter 2, (Springer, 2004), p. 9 (hereinafter "Oliver"). In fact, "the most significant feature of the urethane pads that is key to the CMP process is the formation of asperities on top of the pad by the process of conditioning." Oliver, p. 9.

Examples of polishing pads without externally produced surface texture have much lower polishing rates than the 600 Å/min polishing rate recited in the currently pending claims. In U.S. Patent 5,489,233 (Cook et al.) (Document AE in the concurrently filed Information Disclosure Statement), a solid polyurethane polishing pad has a polishing rate of less than 50 Å/min with no externally produced macro or microtexture (col. 7, Example 2). However, after microtexture was added with a diamond conditioning device, the polishing rate increased to 564 Å/min, or after macrotexture was introduced by cutting, the polishing rate increased to 570 Å/min (col. 7, Examples 2 and 3).

Winings and Xu are consistent with the knowledge of one of ordinary skill in the art that externally produced texture, either micro or macrotexture, is generally required for effective polishing. For example, Winings does not discuss any details regarding the polishing pad, while Xu discloses secondary operations useful for providing a surface finish include "sanding, cutting, milling, sawing, embossing, and laser ablating" (col. 5, lines 35-38). Additionally, Xu describes a step in which grooves are formed by lathing in the flow diagram illustrating a method of manufacturing the chemical-mechanical polishing belt (col. 7, lines 4-10). Therefore, the cited references do not teach or suggest a polyurethane pad that exhibits a polishing rate of 600 Å/min or greater *without externally produced texture* as required by the pending claims.

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In view of the foregoing, the present invention must be considered unobvious, and the obviousness rejections of the pending claims should be withdrawn.

Discussion of Non-Statutory Double Patenting Rejection

The Office Action rejects claims 1-15 under the judicially created doctrine of obviousness-type double patenting as allegedly claiming an invention that is unpatentable over claims 1-13, 15, and 16 of copending Application No. 10/792,183 and claims 1-15 and 17-31 of copending Application No. 10/281,782. Applicant respectfully traverses.

Under 35 U.S.C. § 121, “a patent issuing on an application with respect to which a requirement for restriction under this section has been made, or on an application filed as a result of such a requirement, shall not be used as a reference in the Patent and Trademark Office or in the courts against a divisional application or against the original application.” Section 121 prohibits double patenting rejections using a patent or application subject to a restriction requirement as a reference against a divisional application if the divisional application is filed before the issuance of the patent. See MPEP 804.01. Application No. 10/281,781, the parent of the present application, was subject to a restriction requirement. As a result, Application No. 10/792,183 and the present application were filed as divisional applications directed to subject matter restricted out of the parent application. Therefore, under 35 U.S.C. § 121, the obviousness-type double patenting rejections are improper.

In view of the foregoing, obviousness-type double patenting rejections of the pending claims should be withdrawn.

Conclusion

If, in the opinion of the Examiner, a telephone conference would expedite the prosecution of the subject application, the Examiner is invited to call the undersigned attorney.

Respectfully submitted,



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